PRELIMINARY STUDIES ON THE CONTROL OF INSECT PESTS OF COTTON

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INTRODUCTION

COTTON as a crop for the dry zone is gaining in importance and the need has been felt for the study of the insect pests, their importance and methods of their control. At the present time pest attack on cotton is not very severe although all known pests are observed on the crop. This is probably due to the cultivation of the crop being restricted to small localised areas. The pest situation may be different with increased cultivation of the crop.

Harbord (1937) mentions that pest incidence was low in the Hambantota District in 1937 when a yield of 10–11 cwt. per acre was obtained. There had been a minor outbreak of leaf roller which was controlled by predatory wasps. Damage by boll worm and cotton stainers was small. There is hardly any other information in the literature regarding any observations made in Ceylon on the pests of cotton.

MAJOR INSECT PESTS

From observations made during two years at the Dry Zone Research Institute, Maha Illuppallama, and the cotton growing tracts in the area, the following major pests are listed in order of their local importance :—

1. *Aphis gossypii* G.—The cotton aphid.
2. *Sylepta derogata* F.—The cotton leaf roller.
3. *Earias fabia* Cram.—The spotted boll worm.
4. *Oxycarenus latus* Kirby—The dusky cotton bug.
5. *Dysdercus similis* Freeman—The red cotton bug.
6. *Pectinophora gossypiella* Saund.—The pink boll worm.

TRIAL ON THE CONTROL OF INSECT PESTS

Materials and Methods

The trial on the control of insect pests was conducted at Maha Illuppallama, during Maha 1959-60. H. C. 101 cotton was planted at 3 ft. × 2 ft. spacing in 30 ft. × 20 ft. plots and plants thinned out to two per hill. There were three replicates and 25 plots per replication. The total trial area was about 1 acre.

The insecticides and concentrations tried are as follows :—

1. B. H. C.	20% *E. C.	Low 1† & Low 2—1 fl. oz. in 2 gal. water.	
		High 1 & High 2—1 fl. oz. in 1 gal. water.	
2. D. D. T.	25% E. C.	Low 1 & Low 2—1 fl. oz. in 2 gal. water.	
		High 1 & High 2—1 fl. oz. in 1 gal. water.	
3. Dipterex	50% E. C.	Low 1 & Low 2—1 fl. oz. in 6 gal. water.	
		High 1 & High 2—1 fl. oz. in 3 gal. water.	
4. Endrin	20% E. C.	Low 1 & Low 2—1 fl. oz. in 4 gal. water.	
		High 1 & High 2—1 fl. oz. in 2 gal. water.	
5. §E. P. N.	25% E. C.	Low 1 & Low 2—1 fl. oz. in 6 gal. water.	
		High 1 & High 2—1 fl. oz. in 3 gal. water.	
6. Gusathion	20% E. C.	Low 1 & Low 2—1 fl. oz. in 6 gal. water.	
		High 1 & High 2—1 fl. oz. in 3 gal. water.	

(*E. C.—Emulsion concentrate).

(1†—Insecticide applied at fortnightly intervals).

(2‡—Insecticide applied according to pest incidence).

§(E. P. N.—Ethyl—p—nitrophenyl benzenethiophosphonate).

Six insecticides were used at two concentrations each. Each concentration was applied at fortnightly intervals and as and when pest incidence required. Pest incidence was such that all plots were sprayed roughly at fortnightly intervals. The crop was sprayed six times during the trial. Due to very heavy continuous rains in the early stages, the germination rate in the trial was poor. This, added to difficulties in filling vacancies and weeding, resulted in poor stands. Out of an expected 100 hills per plot there was an average of 75 hills a range of 54-95. The average number of plants per plot was 115 (Range 86–145) out of an expected 200.

Pest incidence was assessed on the basis of counts taken at fortnightly intervals. Aphid infestation was taken from 20 plants selected at random from each plot. Leaf rollers were counted from each plant in the plot. Boll worms were assessed on the basis of the number of bolls attacked on five plants selected at random and fixed.

Pest Incidence

Aphis gossypii: The cotton aphid was the most serious pest of cotton in the area. It appeafs when the crop is about 6 weeks old and persists right through the season. About 80-90 per cent of the plants are usually attacked. The aphid incidence in various treatments is given in Table 2. It was difficult to take any quantitative counts of incidence, as the insects are small and found in large numbers on the plant. Therefore the table gives only the number of plants positive for aphids, irrespective of the intensity of infestation. Although it was observed that in the untreated plots aphid infestation was much heavier, there was not much difference in the number of plants infested. The number of plants attacked by aphid in the endrin treated plot and the control is given in Fig. 2.

Sylepta derogata: The leaf roller started appearing when the crop was 12 weeks old and persisted in small numbers right through the season. Damage due to leaf roller was not heavy. The leaf roller incidence in the various treatments is given in Table 1. A comparison of some of the better insecticides with the control is given in Fig. 2.

Earias fabia: The spotted boll worm was observed once during boll formation and with one spraying with insecticide it almost completely disappeared. The number of bolls attacked was about 5 per cent which is very low compared to observations made by Deshpande and Nadkarny (1936) in Bombay State where damage by boll worm was as high as 50 per cent.

Oxycarenus latus: was seen on the opened bolls but no serious damage was observed.

Dysdercus similis and Pectinophora gossypiella: were very scarce during the period of observation.

Results and Discussions

Of the insecticides tried, endrin at a concentration of 1 fl. oz. in 2 gallons water gave very good control of the pests and significantly higher yields than the untreated control. Walker and Haidari (1954) also reported excellent increase in yields in Iraq by the use of endrin at the rate of 1 lb. per acre against aphids. The yield figures are given in Table 3. In three 30 ft. by 20 ft. plots, the yield from the endrin treated plots was 66.2 lb., the equivalent of 1,602 lb. per acre, and from the best of the three plots was 24 lb. which works out to 1,766 lb. per acre. The untreated control gave only 41.6 lb. in three plots—the equivalent of 1,006 lb. per acre. The yield from the entire

trial area of about an acre was 1,207.8 lb. These yields were obtained inspite of the average stand of the crop being less than 60 per cent of the expected stand. D.D.T. at 1 fl. oz. in 2 gallons water and E.P.N. at 1 fl. oz. 3 gals. water gave good control of pests and significantly higher yield than the control. D.D.T. at 1 fl. oz. in 1 gallon water gave very low yields and this was not unexpected as the stand in the plots was very poor.

The cost per application with endrin at the above dose would work out to about Rs. 12 at the rate of about 40 gallons of spray liquid per acre. The total cost per season would be Rs. 60 to Rs. 75 per acre for six applications. The yield increase by this application would more than adequately compensate the cost of treatment with insecticide.

Summary

Insect pests can cause severe damage to cotton crops in the dry zone and limit production. Observations made at Maha Illuppallama reveal that the more important pests are: (1) *Aphis gossypii G.*—the cotton aphid, (2) *Sylepta derogata* F.—the cotton leaf roller, (3) *Earias fabia* Cramb.—the spotted boll worm, and (4) *Oxycarenus latus* Kirby—the dusky cotton bug. Although, *Dysdercus similis* Freeman—the red cotton bug, and *Pectinophora gossypiella* Saund—the pink boll worm, had been observed on the crops during two seasons, they do not seem to cause much damage in these areas.

Trials were conducted at Maha Illuppallama to find a suitable insecticide for control. B.H.C., D.D.T., Dipterex, Endrin, E.P.N. (Ethyl-p-nitrophenyl benzenethiophosphonate) and Gusathion were tried at two concentrations each applied (i) at fortnightly intervals and (ii) according to pest incidence. Endrin gave the best control of all the pests and gave significantly higher yields than the untreated checks. D.D.T., and E.P.N., also gave good control of pests.

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TABLE 1

Percentage cotton plants attacked by Sylepta derogata the cotton leaf roller

Treatments		*Percentage cotton plant attacked*				
		Two weeks after each treatment				
		1	*2*	*3*	*4*	*5*
B.H.C.	Low 1	2	2	3	1	1
	Low 2	2	2	4	1	1
	High 1	3	3	2	2	1
	High 2	3	3	4	1	1
D.D.T.	Low 1	2	2	2	1	1
	Low 2	1	2	1	0	1
	High 1	3	3	2	1	1
	High 2	2	2	1	1	1
Dipterex	Low 1	2	3	1	1	1
	Low 2	2	5	3	6	1
	High 1	3	8	4	12	1
	High 2	4	2	4	7	1
Endrin	Low 1	0	1	1	0	1
	Low 2	2	1	1	1	1
	High 1	1	1	1	0	0
	High 2	2	1	1	0	0
E.P.N.	Low 1	2	5	1	1	1
	Low 2	1	1	1	1	1
	High 1	2	3	1	1	0
	High 2	4	2	2	1	1
Gusathion	Low 1	2	3	2	5	1
	Low 2	2	5	5	8	1
	High 1	5	5	4	8	1
	High 2	7	12	6	10	1
Control		5	14	10	14	16

TABLE 2

Percentage cotton plants attacked by Aphis gossypii—the cotton aphid—in sixty selected plants from each treatment

Treatment		*Percentage cotton plants attacked*						
		Before treatment	*Two weeks after each treatment*					
			1	*2*	*3*	*4*	*5*	*6*
B.H.C.	Low 1	47	51	52	59	22	65	65
	Low 2	27	59	63	57	25	56	80
	High 1	27	26	72	45	18	47	70
	High 2	33	23	77	48	33	53	81
D.D.T.	Low 1	47	53	63	53	33	67	75
	Low 2	20	70	62	53	15	56	66
	High 1	27	56	63	48	23	59	80
	High 2	30	63	67	68	42	68	85
Dipterex	Low 1	13	46	60	43	10	56	75
	Low 2	20	69	43	50	20	56	75
	High 1	27	46	66	50	18	51	65
	High 2	33	63	70	68	20	54	81
Endrin	Low 1	40	43	50	43	32	57	64
	Low 2	20	39	37	38	27	59	63
	High 1	13	38	57	37	15	31	79
	High 2	20	33	70	43	18	59	67
E.P.N.	Low 1	40	57	63	66	22	57	75
	Low 2	27	57	43	48	38	57	81
	High 1	27	46	66	72	32	53	82
	High 2	40	49	82	68	17	70	86
Gusathion	Low 1	27	57	53	66	10	77	67
	Low 2	33	56	66	55	35	75	68
	High 1	33	66	67	60	23	77	79
	High 2	47	49	70	55	43	56	79
Control		20	59	75	86	55	75	82

TABLE 3

Cotton yields in pounds, obtained from 30 ft. × 20 ft. plots in three replicates during Maha 1959-60

Treatment		Weight of cotton in pounds				Yield in pounds per acre
		Rep. 1	Rep. 2	Rep. 3	Total	
B.H.C.	Low 1	14·7	13·3	13·5	41·5	1,004
	Low 2	13·3	12·4	14·3	40·0	968
	High 1	15·5	17·3	12·4	45·2	1,093
	High 2	12·2	17·6	18·2	48·0	1,162
D.D.T.	Low 1	24·2	21·4	16·8	62.4	1,511
	Low 2	16·7	17·3	17·5	51·5	1,246
	High 1	15·4	10·4	15·6	41·4	1,002
	High 2	15·1	19·7	12·1	46·9	1,135
Dipterex	Low 1	20·0	16·3	16·7	53·0	1,282
	Low 2	17·1	12·4	15·4	44·9	1,086
	High 1	16·8	13·8	14·4	45·0	1,089
	High 2	15·0	14·1	14·0	43·1	1,043
Endrin	Low 1	14·4	14·4	18·9	47·7	1,154
	Low 2	19·9	16·3	16·0	52·2	1,263
	High 1	22·0	20·2	24·0	66·2	1,602
	High 2	22·5	16·2	14·0	62·7	1,275
E.P.N.	Low 1	13·7	17·0	14·8	45·5	1,101
	Low 2	14·7	11·7	12·4	38·8	941
	High 1	15·8	19·4	21·8	57·0	1,379
	High 2	19·2	21·0	20·9	61·1	1,478
Gusathion	Low 1	13·3	14·6	17·9	45·8	1,108
	Low 2	16·6	13·0	11·7	41·3	999
	High 1	17·9	13·6	15·9	47·4	1,147
	High 2	16·1	15·3	16·2	47·6	1,159
Control		18·6	8·6	14·4	41·6	1,006
	Total	420·7	387·3	399·8	1,207·8	—

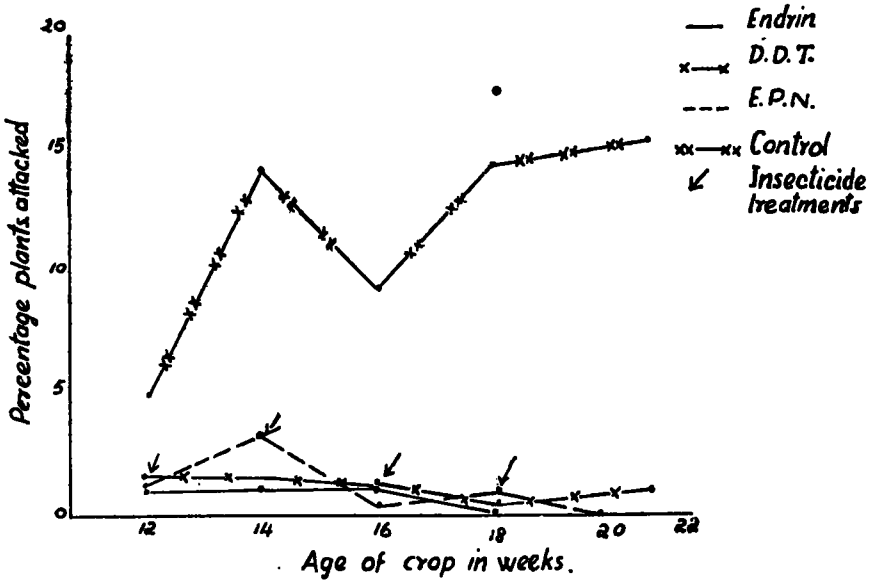

Fig. 1.—Percentage plants attacked by cotton leaf roller in plots treated with endrin, D. D. T. and E. P. N. and in the untreated control.

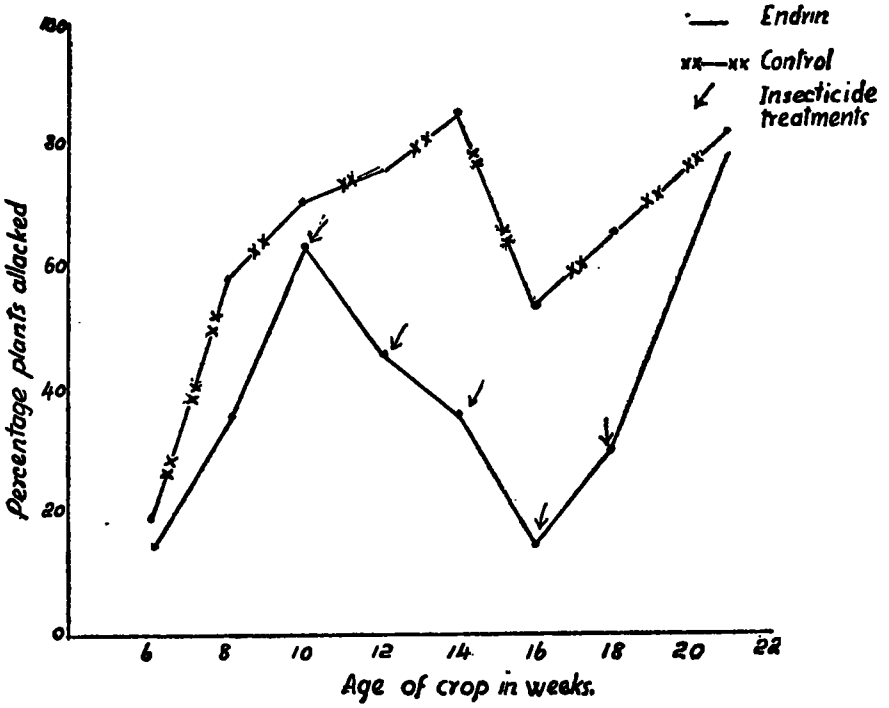

Fig. 2.—Percentage plants attacked by cotton aphid in the plots treated with endrin and in the untreated control.